

## ZAPPED! CAPACITORS CHARGE AGAINST MICROBES

*High-energy capacitors zap pathogenic microbes to purify water, sterilize pharmaceutical products, and reduce bacteria levels on foods.*



■ A large international food chain will use PurePulse's PureBright® system (pictured above) to decontaminate water.

You may not recognize its tongue-twisting scientific name. But you might remember *Cryptosporidium* was the “bug” that made Milwaukee famous.

In this city during the summer of 1993, a major outbreak of the waterborne parasite occurred, sickening more than 400 people. By the time the outbreak ended, 100 people had died. It was the largest episode of waterborne disease in the United States in the 70 years since health officials began tracking such outbreaks.

PurePulse Technologies, Inc., a subsidiary of Maxwell Technologies, Inc. (San Diego, CA), has developed a fast and efficient method for eliminating deadly bacteria, viruses, and other microorganisms, including *Cryptosporidium*. Dubbed PureBright®, this system uses concentrated energy in short, high-intensity pulses to rupture the membranes of pathogenic microbes without using heat, chemicals, or ionizing radiation. Based on advanced high-energy capacitors, the system offers kill rates 100 to 10,000 times those of conventional mercury lamp ultraviolet treatments.

**A little zap will do.** Capacitors, the key to PureBright technology, accumulate electrical charge and energy on the surfaces of conducting plates that are insulated from each other by a dielectric material. Maxwell developed its capacitors by using insulating materials with a higher dielectric constant, reducing the thickness of the material, increasing the voltage between conductors, and reducing the thickness of the conducting plates. BMDO partially funded development of these capacitors to produce a compact, lightweight device that could provide pulsed power for space-based lasers and accelerators.

PureBright is highly effective in killing microorganisms such as vegetative bacteria, yeasts, molds, bacteria spores, and viruses. “The light does not penetrate opaque materials, but is transmitted through many types of clear packaging materials, fluids, and air,” says Kent Salisbury, Maxwell’s PurePulse program manager. “PureBright’s extremely short exposure time greatly reduces the potential for material degradation. The treatment is a clean process, leaving no chemical residues and requiring no evacuation steps.”

PurePulse is aggressively capitalizing on its unique PureBright technology in the commercial marketplace by forming alliances and establishing licenses. For

example, the company has teamed with Tetra Pak and Automatic Liquid Packaging to commercialize the PureBright process for food and pharmaceutical packaging applications, respectively. In another example, PurePulse and a major manufacturer and marketer in the health care field agreed to pursue a licensing and purchase agreement to use PureBright technology for sterilizing certain disposable consumer products. This agreement involves technology rights and the purchase of several PureBright systems, with a value over \$2 million over the next several years.

The company recently found a new market for PureBright technology—water purification. Thanks to a \$1 million grant from a large international food chain, PurePulse has developed a system that can clean 4 gallons of water a minute and easily fit into commercial kitchens. The system will allow restaurants to serve their customers safer water, hot and cold beverages, and ice cubes. With field testing nearly complete, the water purifier will soon be available on the market.

**Ultrapure water.** PurePulse is also making significant inroads in industry. In early 1998, the company signed an agreement with Pall Corporation that could lead to the commercialization of its PureBright technology for producing high-purity water for the semiconductor industry. According to PurePulse, the market for ultrapure water for semiconductor manufacturing and other industrial scientific applications is estimated to be over \$200 million.

High-energy density capacitors similar to those used in PureBright systems also have been incorporated into heart defibrillators that deliver an electrical current (a shock) to a heart in cardiac arrest. The defibrillator interrupts the heart's chaotic heart rhythm, known as ventricular fibrillation, allowing it to stop very briefly and begin beating again rhythmically; the sooner the heart can be defibrillated following cardiac arrest, the greater the patient's chance of survival. Maxwell has developed four types of external heart defibrillators and annually sells about 20,000 of them to 10 original equipment manufacturers.

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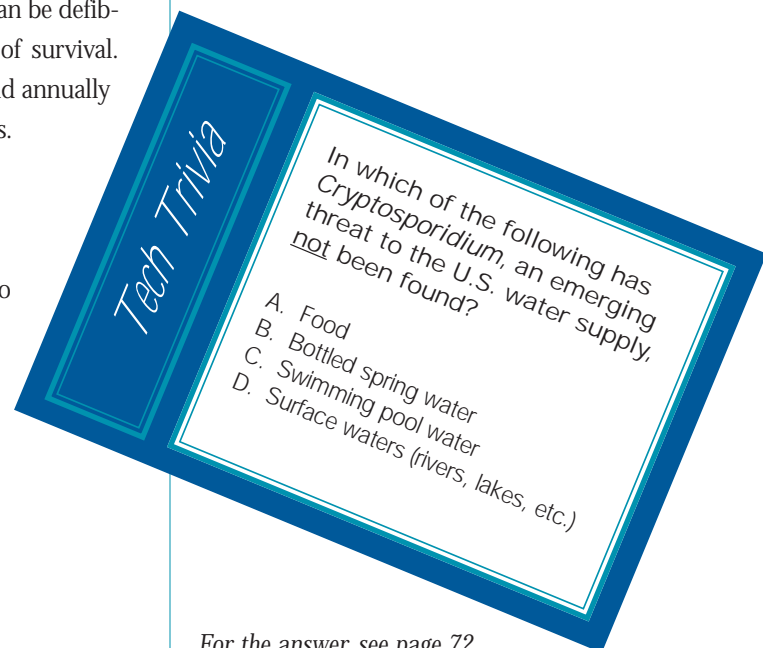
#### What Does It Mean to You?

Short, intense pulses of light can help eliminate deadly bacteria, viruses, and other microorganisms, allowing restaurants to serve safer drinking water, hot and cold beverages, and ice cubes.



#### What Does It Mean to Our Nation?

Pulsed-power technologies are being used more often to purify water, helping stave off widespread outbreaks of *Cryptosporidium* and other deadly microorganisms.



For the answer, see page 72.